Site Seeing Beginning Level

Purpose

The overall purpose of these pre-protocol activities is to introduce students to the concept of a system. The supporting concepts are boundaries, inputs, outputs, and feedback loops. The concept of a system will help students understand why they are conducting the biometry measurements on the 30 x 30 m Biology Study Site.

Overview

Students will investigate the environment of their 30 m x 30 m Biology Study Site. The students will use simple observational techniques to quantify and qualify their observations. The intention is that students will become curious about their system.

Purpose

The beginning activity will help students determine that a system's boundaries are often delineated depending upon the question the scientist wants to answer.

Time

Two or three class periods

Level

Beginning

Key Concepts

- Your 30 m x 30 m Biology Study Site can be considered a system.
- Your system contains certain elements within it such as trees, water, soil, rocks, and animals.
- Your system has inputs such as sun's energy, water, carbon dioxide, oxygen, dust.
- Your system has outputs such as water, carbon dioxide, oxygen, and heat.

Skills

- *Observing* your system
- *Drawing* your system
- *Interpreting* maps as a data source

Materials and Tools

- Paper
- Colored pencils or crayons
- Compasses
- 30 m x 30 m Biology Study Site sketch sheet
- Camera

Preparation

The 30 m x 30 m Biology Study Site should be laid out.

Prerequisites

Students should understand why they are conducting the *Biometry Protocol* on this site.

Students should know how to use a compass.

Background

Scientists investigate natural systems for a variety of reasons. A *system* is any collection of *things* that have some influence on one another and appear to constitute a unified whole. The things can be almost anything, including objects, organisms, machines, ideas, numbers, or organizations. The question a scientist wants to answer often times determines the boundaries of the system. For example, an ecologist might want to study an entire ecosystem type such as wetlands to determine the amount of acreage still left in the world, or a specific species of wetland plant might be studied to experiment with different restoration techniques. Or a scientist might want to study one type of cell in a wetland plant to determine the plant's sensitivity to certain kinds

of pollution. These studies would consider completely different factors determined by the scale of the study.

In the biometry protocols, we are looking at a certain system (30 m x 30 m Biology Study Site) for changes over time. These include changes in the growth rate of trees and the times of leaf drop and budding. By collecting data over many years, we can see if the data are consistent over time or if there is variation. To understand the data, students need to be familiar with the variety of factors affecting a system in order to understand the change. If they know what is coming in and out of the system and the basic processing of incoming materials within the system they will be able to see patterns that will help them make generalizations and predictions. For example, water comes into a forested system in the form of rain. Some of the water is stored in the trees and is used in growth. Some is released into the atmosphere. Some stays on the surface. Some percolates into the ground to join the water table.

Data variation could indicate changes in either the input, output, or the cycles that process matter and energy. In a series of drought years, the growth of the trees may be stunted due to the lack of water, stress, production, or fitness. Consistent temperature rises could cause a longer growing season resulting in an increase in production. This may be evident in leaves being on the trees longer or the trees increasing in size at a greater rate during those years, as seen in the rings or tree height. The data your class collect will help your students and the GLOBE scientists understand the system around them.

What To Do and How To Do It

1. Ask the students to sit with a piece of paper and a pencil in front of them. The students should close their eyes and imagine their perfect place in the whole world (e.g. beach forest, next to a fire, in a candy store). Give them a minute to imagine this image. Have them draw their special place on paper. How many of the students imagined a natural area for their special place?
2. Visit the center of your 30 m x 30 m Biology Study Site. Why did the class choose this size and shape study site?
   Answer the following questions for your 30 x 30 m Biology Study Site.
   a. What are the natural boundaries of this system?
   b. What do you see, smell, feel, hear?
   c. Is it wet/dry, warm/cool?
   d. Is there a lot of sunlight hitting the ground?
   e. How many different plants and animals live there?
   f. How many objects are non-living? Are they natural or man-made?
   g. What would your system look like at night?
   h. How would your system change in the different seasons?
3. Staying in the center of your site, ask the students to stand and draw each boundary – North, South, East, and West. These will be side views. Encourage them to be observant and draw details. Have your students save these diagrams in their GLOBE Science Notebooks.
   Note: You can have the students use the 30 m x 30 m Biology Study Site sketch work sheet to draw the site. Save the box in the middle of the work sheet for the micro sketch in step 4.
4. In order to obtain an increased knowledge of the Biology Study Site, have the students lay out on the ground a 1/3m x 1/3m square made of string. Have them draw what they observe within the square.

Have them answer questions a through h in number 2 above. What questions could they study within this square (or system) that they couldn't in the 30 m x 30 m Biology Study Site? How did changing the boundaries change what they saw?

5. Have the students take a soil sample from their individual plots with an auger, trowel, or shovel. Try to get at least 15 cm down into the soil and place it in a plastic sandwich bag. In the classroom, have the students observe the soil with the unaided eye and a 30X microscope. Now what parts do you see? Are there living things here or parts of living things?
6. From the center point, take a picture of each directional view. Once the pictures are developed, have the students compare their sketched views with the photographs. Have they drawn enough detail in their sketches to identify which picture corresponds with each compass direction? Are there parts of the system that they missed?

   Note: You can use the 30 m x 30 m Biology Study Site Sketch Work Sheet. The middle box can be use for the students' drawing.

Discussion Questions

1. What kinds of questions were asked when they changed the boundary of their system?
2. How does what happens in your neighbors square influence what happens in yours?
3. What is above your square and what is below it?
4. Does what is above and below affect your square in any way?
5. Generally what enters and leaves your system? Sunlight? Water? Seeds? Nuts? Animals?